Federal Aviation Administration
Work Breakdown Structure (WBS)

Version 3.0

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INTRODUCTION

This FAA Standard Work Breakdown Structure (WBS) represents, and is defined as, the complete set of activities that may be accomplished to provide a solution that satisfies an FAA mission need. Solutions include products and services such as hardware, software, facilities, communications services, technical assistance services, infrastructure, training, procedures, etc. The elements in the WBS represent activities; not the resources needed to accomplish the activities. The activities are arranged hierarchically and no time-phasing is implied.

The WBS is intended for use across the FAA for developing life cycle cost estimates of solutions. It also supports management of solutions during the solution implementation and in-service management phases, and will aid in the comparison of life cycle cost estimates to actual costs that have been collected through the FAA's Cost Accounting System (CAS). The WBS will provide uniformity in definition and consistency of approach for developing the top three levels of the work breakdown structure. While providing consistency, the WBS also permits flexibility: users need use only those elements that apply to their program, and may add detail below the specified levels as needed.

The WBS aligns with the activities defined in the Acquisition Management System (AMS). In the WBS, Mission Analysis and Investment Analysis activities precede the formal establishment of a specific solution. The remaining elements in the WBS are activities that are directly associated with a specific solution. Within the WBS, the Solution Development and Implementation phases map to the AMS Solution Implementation phase.

This WBS supersedes Version 1.0 as published in the FAA Acquisition System Toolset (FAST) and any other interim WBS documents. This WBS is provided as AMS guidance and applies to all acquisition and research and development programs regardless of cost or appropriation. There are no specific WBS elements for technical refreshment. Tech refresh activities should be structured into the appropriate WBS elements.

The WBS should be used for all acquisition program life cycle cost estimates and for tracking actual costs in the Cost Accounting System. Furthermore, it is recommended that contractors submit proposals utilizing the FAA WBS or show the mapping between the Contractor Work Breakdown Structure (CWBS) and the FAA WBS. The WBS is used to collect costs related to acquisitions and directly feed the FAA Cost Accounting System (CAS), which also collects costs from additional sources.

This version, FAA WBS 3.0, is a collaborative effort between FAA Lines-of-Business, FAA Integrated Product Teams, FAA Office of Investment Analysis and Operations Research, Airways Facilities Financial Management, and Industry. Recommendations for changes, additions or deletions that may be of use in improving this document should be addressed to: Federal Aviation Administration, ASD-410, 800 Independence Ave., S.W. Washington, DC 20591.

1.0 MISSION ANALYSIS

All activities associated with data collection, analysis, and concept exploration and development required to satisfy existing and emerging demand for services.

1.1 Identify Projected Demand for Services

All activities required, including data collection, to identify and quantify projected demand for NAS services, based on diverse inputs in the form of: external demand for service and capacity; long-range plans and projections; local site trends; and performance and supportability trends of fielded equipment.

1.2 Identify Technological Opportunities

All activities required to identify and quantify projected technological opportunities that will enable the FAA to perform its mission more safely, efficiently, and effectively. These activities include review of hardware, software and systems currently available commercially or projected to be available commercially, rather than hardware, software and systems that could be custom developed for the FAA.

Also includes all activities associated with technology transfer of research results, both into the agency and out of the agency, such as presenting research results and attendance at conferences, marketing of research outputs (technology looking for a problem to solve), canvassing of external research programs for applicable innovations, fostering of aviation related academic research programs, etc.

1.3 Identify Projected Supply of Services

All activities required to identify and quantify existing and projected supply of services based on human and system performance and supportability data; external and internal assessments of FAA-provided services; and assessments of current and planned NAS capabilities.

1.4 Mission Needs Analysis and Assessment

All activities required to analyze, quantify and prioritize capability shortfalls (the difference between demand and supply) and technological opportunities to increase operational safety, efficiency, or effectiveness. This includes documentation of the mission analysis itself, and the preparation and approval of Mission Need Statements.

1.5 Initial Requirements Definition

All activities required to translate information in the Mission Need Statement into an initial Requirements Document, consistent with the Operational Concept.

Includes research and development activities required to evaluate and develop initial requirements. Includes the Requirements Correlation Matrix and the Mission Need Correlation Matrix.

2.0 INVESTMENT ANALYSIS

All activities required to accomplish the Initial (2a) and Final (2b) Investment Decisions by the Joint Resources Council (JRC), as defined in the Acquisition Management System.

2.1 Initial Investment Decision

All activities required in transforming information from the Operational Concept, Mission Need Statement, initial Requirements Document, and other sources to conduct an investment analysis for an Initial Investment Decision by the JRC.

2.1.1 Planning

All activities required in forming an Investment Analysis Team, developing an Investment Analysis Plan (IAP), identifying what metrics are affected by the planned investment, and coordinating the planned activities.

2.1.2 Analysis

All activities associated with data collection, Industry Day activities, market surveys and modeling to support quantitative and qualitative analyses of the activities identified in the IAP. Includes the technical, operational, life-cycle costs, benefits, risk and return on investment analysis of the alternatives. For each alternative, human factors, safety, security, architecture, and affordability assessments will also be performed where appropriate. Also includes activities such as business case development for the preferred alternative and coordination of the analysis and findings with the sponsor, JRC members, and stakeholder organizations.

2.1.3 Documentation

To complete the Initial Investment Decision, the documentation activities include: JRC-2a briefing package, updated initial Requirements Document, initial Acquisition Program Baseline (APB), initial Acquisition Strategy, and initial Investment Analysis Report with exit criteria for the final Investment Analysis Decision.

2.2 Final Investment Decision

All activities required in transforming information from the 2a Initial Investment Decision and other sources to conduct an Investment Analysis for a Final Investment Decision by the JRC.

2.2.1 Planning

All activities required in forming an Investment Analysis Team, developing an Investment Analysis Plan (IAP), and coordinating the planned activities.

2.2.2 Analysis

All activities required to conduct detailed technical, operational, life-cycle costs, benefits, risk and return on investment analyses to finalize the Acquisition Program Baseline (APB) of the preferred alternative. Human factors, safety, security, architecture, and affordability assessments will also be performed as required. This also includes activities like the business case for the proposed acquisition, coordination of the analysis, findings, and final APB with the sponsor, JRC members, and stakeholder organizations prior to Contract Award.

Also included are activities related to preparing Requests for Information (RFIs), Requests for Offer (RFOs), and evaluating proposals from industry, academia, and other government laboratories.

2.2.3 Documentation

To complete the Final Investment Decision, the documentation activities include: JRC-2b briefing package, revalidated Mission Need Statement, final Requirement Document, final APB, final Acquisition Strategy, final Integrated Program Plan (with Risk Management Plan), and final Investment Analysis Report.

2.3 Rebaseline Decision

All activities required to rebaseline the Acquisition Program Baseline for JRC approval. This phase includes activities related to updating, coordinating, and documenting the updated APB with the sponsor, JRC members and stakeholder organizations.

3.0 SOLUTION DEVELOPMENT

All activity required for the Solution Development, e.g., hardware system, software, security considerations, facility, physical infrastructure, and telecommunications. This includes all activities associated with initial development, modifications, upgrades, pre-planned product improvements, and technical refresh.

3.1 Program Management

Business and administrative planning, organizing, directing, coordinating, controlling, and approval actions designed to accomplish overall program objectives.

3.1.1 Program Planning, Authorization, Management and Control

All activities required to develop the strategy for implementing and executing the overall program.

All activities required to plan, authorize and manage all actions and activities that must be accomplished for successful program development which includes preparation of the Acquisition Strategy Paper and Integrated Program Plan and project-specific input to agency-level planning documents, such as the call for estimates, Blue Sheets, White Sheets, the Capital Investment Plan (CIP), and the NAS architecture. It also includes all activities required to ensure that all cost, schedule, performance, and benefit objectives are met.

3.1.2 Contract and Grant Management

All activities to award, issue, modify, monitor and manage project-related contracts, grants, partnerships, Cooperative Research and Development Agreements, Interagency Agreements, Foreign Partnerships, Memoranda of Understanding, and Memoranda of Agreements.

3.2 System Engineering

All technical and management activities associated with a specific solution that concentrates on the definition, design and application of the whole system throughout the program life cycle. These activities include the planning, directing and controlling a totally integrated engineering effort of a solution.

Systems engineering consists of such functional disciplines as requirements definition and allocation; analysis, design, and integration; value engineering; supportability, maintainability, and reliability engineering; quality assurance; interface management; configuration management; human factors; security; safety engineering; and specialty engineering.

3.2.1 System Engineering Management

Includes activities to plan, manage, support, execute, and maintain system engineering processes and work including the following:

- The preparation of the Systems Engineering Management Plan (SEMP), specification tree, program risk analysis, system planning, decision control process, technical performance measurement, technical reviews, subcontractor and vendor reviews, work authorization, and technical documentation control.

- Activities to measure and improve the effectiveness and efficiency of system engineering processes.

- Integrated technical planning to provide program management with specific guidance and direction on how to execute a requirement-based and structurally-managed program.

3.2.2 System Requirements and Definition

All activities necessary to transform the performance requirements of a final Requirements Document into specifications and a preferred solution configuration. This system engineering effort, which is applicable to each component of the solution throughout the program lifecycle, includes developing and maintaining design criteria and preparing and maintaining system-level data flows, block diagrams, change proposals and documentation trees. It includes the following activities:

- Requirements management activities to identify and manage the requirements that describe the desired characteristics of the system. The Requirements Management process defines, collects, documents, and manages all requirements, including the complete requirements set consisting of the Mission Need Statement (MNS), the initial Requirements Document (iRD) and final Requirements Document (fRD), and the system and procurement specifications.

- Risk management activities to identify and analyze the uncertainties of achieving program objectives and develop plans to reduce the likelihood and consequences of those uncertainties. Risk management is applied throughout the acquisition management lifecycle to (1) identify and assess risk areas; (2) develop and execute risk mitigation or elimination strategies; (3) track and evaluate mitigation efforts; and (4) continue mitigation activity until risk is eliminated or its consequences reduced to acceptable levels.

- Lifecycle engineering to identify and manage requirements for system lifecycle attributes including real estate management, deployment and transition, integrated logistics support, sustainment/technology evolution, and disposal.

- Functional analyses to describe the functional characteristics based on stakeholders' needs, using functional flow diagramming as a representative structured analysis process, and to translate the needs into a sequenced and traceable functional architecture.

- Synthesis of alternatives to define design solutions to identify systems that will satisfy the requirements baseline. Synthesis translates the requirements, as set in context by the Functional Architecture, into the design architecture, consisting of the Physical Architecture with its associated technical requirements.

3.2.3 Analysis, Design, and Integration

Activities to accomplish the overall analysis, design and integration of the solution, e.g., hardware system, software, facility, telecommunications. Includes design integrity analysis, intra- and inter-system compatibility assurance (interface identification, analysis, design, and management), and the integration and balancing of reliability, maintainability, producibility, safety, and survivability. Design includes allocating functions to appropriate elements (e.g., hardware, software, telecommunications, user functions, services, facilities, etc.), and presenting prepared design information at identified design reviews.

3.2.4 Value Engineering

All activities involved in analyzing current designs versus alternative designs in order to quantify the value added and cost reduction of alternative architectures.

It also includes trade studies to analyze a series of design alternatives and recommend the most balanced (cost, reliability, testability, supportability, survivability, compatibility, and producibility) technical solutions among a set of proposed viable solutions.

3.2.5 Supportability, Maintainability, and Reliability Engineering

All engineering activities and analyses undertaken during solution development as part of the engineering and design effort, to assist in complying with supportability and other logistics support objectives.

All activities associated with supportability analyses to identify how to most cost effectively support the system over its entire life cycle.

All maintenance planning activities required to measure the ability of an item or solution to be retained at or restored to a specific condition of readiness.

All activities associated with reliability engineering, defined as the engineering process required to examine the probability of a solution performing its mission adequately over the intended period of time and under expected operation conditions.

3.2.6 Quality Assurance Program

All activities associated with development of planning, procedures, examinations, and tests required during procurement, production, receipt, storage, and issue that are necessary to develop the solution in accordance with identified standards and specifications. It includes:

- Integrity of analyses activities to validate that analyses provide the required level of fidelity and accuracy in a timely manner. An Analysis Management Plan that outlines the details of the various analysis methods and tools is either generated or incorporated into the Integrated Program Plan (IPP).

- Validation and verification activities to determine that the system and process requirements are correct and have been met and that the system is ready for use in the operational environment for which it is intended (i.e., that the system requirements are unambiguous, correct, complete, consistent, operationally and technically feasible, and verifiable). There are two categories of verification: test and assessment. Test is the disciplined and controlled subjection of the system requirements to conditions that replicate operations in a real or simulated action. Assessment includes analysis, demonstration, inspection, verification by similarity, validation of records, simulation, and review of design documentation.

3.2.7 Configuration Management

All activities to establish and maintain consistency of a product's performance, functional, and physical attributes with its requirements, design, and operational information throughout its life. This includes the establishment, monitoring and administration of change control procedures, including collection, processing, distribution and tracking of modification request forms, establishment and administration of change control boards, and formal audits to compare product to documentation. Includes configuration management of hardware, software, facilities, data, interfaces, tools, and documentation.

3.2.8 Human Factors

All activities required to integrate, as a comprehensive technical and engineering effort, human capabilities and limitations with equipment (hardware and software), systems, procedures, jobs, facilities, environments, staffing, training, personnel and organizational management, for safe, comfortable, and effective human-system performance.

3.2.9 Security

All engineering activities and tasks associated with security policy, requirements, and issues (e.g., information security, physical security, and personnel security).

Information security evaluates the vulnerability of the system to unauthorized access and use, or susceptibility to sabotage, and assesses the ability of the system to survive a security threat in the expected operational environment. The FAA is also obligated to protect proprietary information to which it has access.

Physical security applies to aviation industry operations and activities, and to supporting infrastructure such as communications, sensors, and information processing. In addition, physical security applies to the staffed facilities which the FAA leases, owns, and operates.

Personnel security applies to all FAA positions and FAA contractor positions (inclusive of persons employed as or by contractors, subcontractors, or consultants).

3.2.10 System Safety Engineering and Management

The planning, conduct, and documentation of activities, throughout the acquisition management lifecycle, to identify, classify, analyze, and assess hazards. It also includes measures to mitigate hazards or reduce risk to an acceptable level, verification that mitigation measures are incorporated into product design and implementation, and assessment of residual risk.

3.2.11 Other System Engineering Specialties

Includes specialty engineering activities to analyze system, requirements, functions, solutions, and/or interfaces using specialized skills and tools. These activities assist in the derivation of requirements, synthesis of solutions, selection of alternatives, and validation and verification of requirements.

Electromagnetic Environmental Effects (E3) analyzes the system for susceptibility and/or vulnerability to electromagnetic fields or capability

to generate such fields that might interfere with other systems. It identifies sources of interference, and the means for correction within the levels prescribed by law, program requirements, spectrum management, or recognized standards. E3 is composed of Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC).

Hazardous Materials Management/Environmental Engineering determines environmental impacts at deployment sites and during operations, including both environmental impacts on the system and system impacts on the environment during all phases of the product life.

3.3 HW/SW Design, Development, Procurement, and Production

All activities required to design, develop procure hardware and software configuration items, and developing prototypes at the development facility, and the resulting integration, testing, assembly, checkout, and production. Includes R,E, & D projects.

3.3.1 Hardware Design and Development

All activities associated with detailed design, fabrication, assembly and checkout of all Hardware Configuration Items (HWCIs) of the initial unit(s) including all necessary security considerations. A HWCI is an aggregation of hardware that is designated for configuration management and treated as a single entity in the configuration management process.

3.3.2 Software Design and Development

All activities associated with the detailed design, prototyping, development and unit-level checkout of all Computer Software Configuration Items (CSCIs) including all necessary security considerations. A CSCI is an aggregation of software, or any of its discrete portions that satisfies an end use function and has been designated for configuration management.

3.3.3 HW/SW Integration, Assembly, Test and Checkout

All activities associated with development site integration, assembly, and checkout of hardware, software, system security and telecommunications components. Included are interface materials and parts required for the in-plant integration and assembly into the system within suppliers' facilities, and all materials and parts or other interfacing equipment furnished by the integrating agency or contractor.

3.3.4 Production Engineering

Engineering activities involved in taking the development system to production. This includes developing and maintaining production process documentation.

3.3.5 Procurement/Production

All procurement associated with the project including electronic equipment and project materiel not included in other engineering and construction contracts (e.g., Commercial Off-the-Shelf (OTS) or Non-Developmental Items (NDI)). This includes procurement of hardware and software for technology refreshment.

All activities associated with full-scale production necessary to fulfill quantity requirements for solution implementation. Includes all activities related to contractor-conducted testing performed on each end item before it leaves the factory to verify that the end item conforms to applicable specifications, and is free from manufacturing defects. Includes any non-recurring production start-up costs associated with the production of the solution such as facility expansion or construction, retooling or production equipment acquisition or modification, etc.

3.4 Physical and Airspace Infrastructure Design and Development

All activities associated with the planning, design, and development of facilities, physical infrastructure, and airspace, including laboratory research test facilities and the supporting infrastructure of the test facilities, e.g., pavement test facility, fire research laboratories, etc.

3.4.1 Facility Planning and Design

All activities associated with translating facility requirements to national level architectural and engineering (A&E) facility design, planning and programming to accommodate site-specific needs. Includes design of lighting, space, environment, heating, ventilation, air conditioning, grounding, bonding, shielding, lightning protection, cabling, physical security requirements, etc.

3.4.2 Real Estate

All activities associated with determining real estate needs and national level planning and programming for acquisition.

3.4.3 Physical Infrastructure

All activities associated with translating physical infrastructure requirements to national level designs, and planning and programming to

accommodate site-specific needs. Includes design of telecommunications, power systems, water and sewage systems, etc. Also includes activity associated with national purchases.

3.4.4 Airspace Redesign

All activities associated with developing and approving a major airspace redesign. This includes the modeling, simulation, and environmental assessment of airspace redesign alternatives.

3.5 Test and Evaluation

All testing, analysis, and evaluation activities necessary to verify and validate that products meet specifications, satisfy requirements and are operationally suitable and effective. This includes research testing; System Engineering activities associated with Test and Evaluation are collected under System Engineering, Section 3.2.

3.5.1 System Development Test and Evaluation

All activities associated with contractor conducted testing (e.g., factory acceptance testing) performed during the system development process to verify that the new system is operating properly so as to achieve government acceptance.

These are conducted to demonstrate that all engineering design and development activities are complete, and that the system will meet specifications and security certification and authorization criteria. Development test and evaluation includes contractor and in-house activities associated with this effort, e.g., software validation and verification, system and software access controls. All support activities (e.g. technical assistance, maintenance, labor, material, support elements and testing spares, etc.) required during this phase of testing are included.

Development and construction of those special test facilities, test simulators, test beds and models required for performance of the developmental tests necessary to prove the design and reliability of the system or subsystem.

3.5.2 System Operational Test and Evaluation

All activities associated with test and evaluation conducted to assess the prospective system's utility, operational effectiveness, operational suitability, and logistics supportability (including compatibility, interoperability, reliability, maintainability, logistics requirements, security administration, etc.). All support activities (e.g. technical

assistance, maintenance, labor, material, support elements and testing spares etc.) required during this phase of testing are included.

All activities associated with development and construction of those special test facilities, test simulators, test beds and models required for performance of the operational tests.

3.5.3 System Independent Software Verification and Validation

All activities performed by organizations other than the developer to determine the degree to which the software fulfills the specifications. Formal verification is a rigorous mathematical demonstration to ensure that the source code conforms to its requirements. Validation is concerned with evaluation of a software product throughout the development process to determine compliance with product requirements.

3.5.4 Independent Operational Test and Evaluation

All activities associated with independent tests and oversight conducted by organizations other than the developer in a realistic environment to confirm the operational readiness (suitability and effectiveness of the system to satisfy requirements) of FAA systems to become part of the NAS. Includes all support activities.

3.6 Data and Documentation

All activities associated with production, delivery and review of FAA programmatic documents and contractor documentation deliverables. Included are managing, coordinating, editing, scheduling, auditing and assembly of the documents and review packages necessary to the functioning of the program. It includes acquiring, writing, assembling, reproduction, packaging and shipping the data. It also includes the activities involved in converting data from contractor format into government format, as well as reproducing and shipping the data.

3.7 Logistics Support

All activities associated with the acquisition of test and measurement equipment, support and handling equipment, support facilities, initial spares and repair parts and training required to support and maintain the system or portions of the system through the complete delivery of the solution, but not directly engaged in the performance of the system mission.

3.7.1 Logistics Support Planning

All planning activities associated with fulfilling the requirements to provide logistics support to the solution.

3.7.2 Test and Measurement Equipment Acquisition

All activities associated with the acquisition of test and measurement equipment which is used to evaluate operational conditions of a system or equipment at all levels of maintenance. It includes the test measurement and diagnostic equipment, precision measuring equipment, automatic test equipment, manual test equipment, automatic test systems, test program sets, appropriate interconnect devices, automated load modules, tap(s), and related software, firmware and support hardware. Packages which enable line or shop replaceable units, printed circuit boards, or similar items to be diagnosed using automated test equipment are also included.

3.7.3 Support and Handling Equipment Acquisition

All activities associated with acquiring tools and handling equipment used for support of the mission system. Equipment typically included is ground support equipment, vehicular support equipment, powered support equipment, materiel handling equipment, and support hardware and software.

3.7.4 Support Facilities Construction/Conversion/Expansion

All activities associated with construction, conversion, or expansion of support facilities for training, testing, inventory, contractor and FAA depot maintenance, hazardous waste management, etc. required for the specific system.

3.7.5 Support Equipment Acquisition / Modification

All activities associated with acquisition or modification of support equipment or software for training, testing, inventory, contractor and FAA depot maintenance, hazardous waste management, etc. required for the specific system.

3.7.6 Support Facilities and Equipment Maintenance

All activities associated with maintenance of support facilities and equipment for training, testing, inventory, contractor and FAA depot maintenance, hazardous waste management, etc. required for the specific system prior to the in-service decision.

3.7.7 Initial Spares and Repair Parts Acquisition

All activities associated with the acquisition, provisioning, packaging, handling, storage and transportation of deliverable spare components, assemblies and subassemblies used for initial replacement purposes in the system hardware. Includes the repairable spares and repair parts required as initial stock to support and maintain newly fielded systems or subsystems, including pipeline quantities, during the initial phase of service at all levels of maintenance and support.

3.7.8 Initial Training

All activities associated with designing, developing, and delivering training services, aids, and materials used to train site technicians, depot technicians, engineers, air traffic controllers, security administrators, Technical Onsite Representatives (TORs), aviation safety inspectors, implementation personnel and other personnel.

4.0 IMPLEMENTATION

All activity required for the site planning and preparation through commissioning. Also includes all activity required for the deployment of the solution into the NAS, including program management, physical integration, and functional integration.

Note: Site Acceptance Test (SAT) activities are not captured here, but are in section 3.5 Test and Evaluation.

4.1 Program Management

Business and administrative planning, organizing, directing, coordinating, controlling, and approval actions designed to accomplish overall program objectives.

4.1.1 Program Planning, Authorization, Management and Control

This includes Program Control, Contract Management, Business and Administrative activities such as planning, organizing, directing, coordinating, estimating, scheduling and controlling, and approval actions designed to accomplish overall program objectives.

It includes all activities required to plan, authorize and manage all actions and activities that must be accomplished for program implementation including preparing project-specific input to agency-level planning documents, such as the call for estimates, Blue Sheets, White Sheets, the Capital Investment Plan (CIP), and the NAS architecture. This also includes all activities associated with security control and all activities for ensuring that all estimating, cost, schedule, performance, and benefit objectives are met.

It also includes all deployment planning activities required to support the deployment of the solution. It includes development and dissemination of deployment planning information to regional and site personnel; tailoring the in-service review (ISR) checklist template; conducting ISR checklist status reviews; developing action plans and briefing package to obtain In-Service Decision; conducting stakeholder meetings; obtaining the In-Service Decision; tracking ISD action plans; and updating the integrated program plan.

4.1.2 Contract Management

All activities associated with the award and management of project-related contracts, including technical support contracts.

4.1.3 Human Resources Planning and Staffing

All activities to plan and finalize staffing requirements at a new facility, including hiring new Airway Facilities and Air Traffic staff, identifying staff relocations, relocating staff (Permanent Change of Station), and identifying overtime and bubble staffing requirements.

It also includes negotiating agreements (memoranda of agreements) with unions within a facility and between facilities, developing administrative and standard operating procedures, and equipment.

4.2 Engineering, Planning, and Design

All engineering activities associated with plant site surveys, design, analysis, and studies. This includes civil, electrical, mechanical, architectural, industrial, and other "non-electronic" plant type engineering disciplines. This includes drafting, coordinating with applicable organizations, and developing plans and specifications.

All electronics engineering activities associated with the electronics installation design, analyses, and studies. This includes spectrum analysis, coordination with sponsoring organizations, and development of installation drawings.

All physical integration activities associated with site modification requirements to ensure that product integrates into the NAS. Physical integration includes all activities required to integrate the solution into the physical environment. This includes all activities to assess site conditions, the current product's physical requirements, and transition requirements. All engineering activities associated with achieving both transition and

operational requirements for physical security. Risk and requirements management activities are also included.

4.3 Environmental and Occupational Safety and Health Compliance

All activities associated with satisfying environmental, energy conservation, occupational safety and health, and hazardous materials laws and regulations for the program and its products. This includes Environmental Impact Statements, Environmental Assessments, Environmental Due Diligence Audits, design reviews for energy conservation and employee safety elements, and other related activities.

4.4 Site Selection and Acquisition

All activities including real estate, initial analysis, data gathering, identifying candidates, analyzing, coordinating, testing, and providing final recommendations for site approval. This includes coordination with all applicable organizations, unions, and the public.

All activities associated with acquiring real estate. This includes development and review of property maps, appraisals, title searches, etc.

4.5 Construction

All activities associated with actual construction or modification of a site. This includes all activities to execute, control, schedule, quality control, and secure plant equipment and utility services to ensure the site meets requirements and provides a safe environment for its life cycle. Also includes construction to complete building construction change orders and resolve Joint Acceptance Inspection (JAI) exception items. This also includes construction and modification of laboratory research test facilities, and the supporting infrastructure of the test facilities, e.g., pavement test facility, fire research laboratories, etc.

4.6 Telecommunications

All activities associated with the implementation of telecommunications services (including system security requirements) required to achieve full operational capability.

4.7 Site Preparation, Installation, Test, and Checkout

All activities associated with installation, site preparation, site acceptance testing, and checkout of hardware, software, and equipment at the site in order to achieve operational status. This includes coordination with all

applicable organizations, unions and the public during installation and transition.

4.8 Commissioning

All activities associated with preparing for and achieving declaration of operational readiness, initial operational capability (IOC), full operational capability (FOC), Joint Acceptance Inspection (JAI), service availability, and commissioning. This includes operational procedure development or modification, declaration of initial operational capability, Notice to Airmen (NOTAM) issuance, field familiarization activities, preliminary and final commissioning, flight inspections, human factors analysis, and other applicable testing. Also includes initial certification activities, initial standards testing and evaluation, and initial publication of certification standards.

5.0 IN-SERVICE MANAGEMENT

All activities required for the In-Service Management Phase.

Includes all activities associated with directly operating, maintaining (both scheduled and unscheduled), or furnishing technical or logistics support for maintenance of FAA systems, sub-systems, services or equipment. It also includes associated travel time required to support the system. Controller costs are not captured within this element except for Backfill Overtime.

5.1 Site Level Maintenance and Certification

All activities associated with preventive site maintenance of hardware and software performed in an attempt to retain an item in specified condition. Includes FAA direct, System Management Office, software maintenance, and contractor staffing.

5.1.1 Periodic Maintenance - Hardware

Includes FAA staff conducted non-recurring and recurring maintenance activities, and prime contractor maintenance activities. Scheduled maintenance to accomplish periodic inspections, condition monitoring, critical item replacements, and calibration. In addition, servicing requirements (e.g., lubrication, fueling, etc.) may be included under the general category of scheduled maintenance. Includes activities specific for certification.

5.1.2 Corrective Maintenance - Hardware

Includes FAA staff conducted non-recurring and recurring maintenance activities, and prime contractor maintenance activities. Includes all unscheduled maintenance actions performed, as a result of system/product failure, to restore the system to a specified condition. The corrective maintenance cycle includes failure identification, localization and isolation, disassembly, item removal and replacement or repair in-place, re-assembly, checkout and condition verification. Also, unscheduled maintenance may occur as a result of a suspected failure, even if further investigation indicates that no actual failure occurred. This also includes activities related to packaging and shipping components to depot-level repair facilities.

5.1.3 System Management Office (SMO) Overhead

Includes management and planning activities at the SMO level.

5.1.4 On-Site Software Maintenance

Includes FAA staff conducted non-recurring and recurring maintenance activities, and prime contractor maintenance activities. It also includes on-site site adaptation activities.

5.1.5 FAA Academy Contractor Maintenance

Includes prime contractor maintenance activities on FAA Academy training systems.

5.2 Modifications

All activities associated with implementation of modifications to in-service hardware and software.

5.3 Maintenance Control

All activities associated with providing oversight/coordination in operating and maintaining the NAS infrastructure including NAS Operation Managers (NOMS).

5.4 Technical Teaming

This element is for travel costs related to Technical Interchange Meetings (TIMs), and other user and industry team meetings associated with the investigation and resolution of general technical issues relating to system performance.

5.4.1 Airways Transportation System Specialists

Travel costs for Airways Transportation System Specialists.

5.4.2 Air Traffic Control Specialists

Travel costs for Air Traffic Control Specialists.

5.4.3 Other

Travel costs for FAA and non-FAA staff other than Airways Transportation System Specialists and Air Traffic Control Specialists.

5.5 Backfill Overtime (BFOT)

This WBS element is used for estimating and budget planning purposes. BFOT is activity associated with meeting 'watch standing' coverage beyond stated staffing requirements Backfill overtime is required when mission critical personnel are away from their normal duty station for an extended period of time such as for training or site preparation, user teams, etc.

5.5.1 Airways Transportation System Specialists

BFOT costs for Airways Transportation System Specialists.

5.5.2 Air Traffic Control Specialists

BFOT costs for Air Traffic Control Specialists.

5.6 Program Support

All administrative activities associated with planning, organizing, managing, and directing actions required in support of operating and maintaining the solution.

5.6.1 Program Planning, Authorization Management and Control

All activities required to plan, authorize, and manage all actions and activities that must be accomplished for operation and maintenance of the solution. This includes preparing project-specific input to agency-level planning documents, such as the call for estimates and NAS architecture. This includes all activities associated with security control. It also includes all activities required to ensure that all cost, schedule, operational performance, and benefit objectives are met.

5.6.2 Contract Management

All activities to award, issue, modify, monitor, and manage of solution-related contracts, such as logistics contracts, service management contracts, equipment repair contracts, and maintenance contracts.

5.7 Logistics

All depot level activities required to support NAS prime mission equipment and associated support equipment.

5.7.1 Supply Support

All activities associated with ordering, receiving, tracking, sending, cataloging, and inventory management of supplies needed in order to operate and maintain the solution. This also includes activities related to packaging, handling, storage and transportation (PHS&T) and on-site space allocation for materials needed to support the solution.

5.7.2 Replenishment Spares

Replacement exchange-and-replace core items and expendable items issued to FAA field sites in support of NAS equipment. It includes material products items stocked at the depot, and direct ship items ordered through the depot but stocked at other commercial or government sites.

5.7.3 Repair

All FAA and commercial activities associated with depot-level repair of equipment in support of the solution. It does not include costs for site-level maintenance.

5.7.4 Logistics Support Services

This includes warranty tracking, periodic maintenance, corrective maintenance, and logistics technical services performed at operational FAA sites by depot personnel. It also includes engineering, logistics and technical support provided by FAA and commercial depot personnel.

5.7.5 Support Equipment Maintenance

All activities associated with replenishment, repair, maintenance and calibration of support equipment.

5.7.6 Technical Data

Includes system specific documentation including blue prints, drawing, repair and test procedures, provisioning data, logistic management information (LMI), and other technical data utilized by or directly associated with depot-level maintenance

5.7.7 Maintenance Support Facilities

Any facility or portion thereof specifically associated with depot-level maintenance of NAS equipment.

5.7.8 CDLS Contracts

Commercial depot logistic service (CDLS) contract costs not captured elsewhere.

5.8 In-Service Training

All activities associated with attrition and refresher training of airways facility system specialists and air traffic controller personnel who directly operate, maintain, or provide support functions of the solution. This does include contractor provided costs as associated with specific training.

Training costs include course development, course conduct (including instructor and facilities costs), and travel and per diem costs for students.

5.8.1 Airways Transportation System Specialists

Training costs for Airways Transportation System Specialists.

5.8.2 Air Traffic Control Specialists

Training costs for Air Traffic Control Specialists.

5.9 Second Level Engineering

All engineering activities in support of the delivery of service, to include development of modifications, documentation configuration management and testing. Includes evaluation, prototype, test and implementation of technology refresh initiatives. Also includes FAA and contractor staffing and travel as applicable.

5.9.1 Program Management & Infrastructure Support

Business and administrative planning, organizing, directing, coordinating, controlling, and approval actions designed to accomplish overall program objectives.

5.9.2 National Airspace System (NAS) Field Support & Restoration

Hardware and software engineering support for all operational and support systems at NAS facilities. Technical support to all NAS facilities to assist NAS personnel in restoration of facilities through direct support via telephone, remote entry, or on-site travel as required. Performing support activities including (1) initial analysis of problems; (2) implementation of measures necessary to restore the system to operational status; (3) implementation and verification of site modifications. These activities include coordination related to NAS outages, centralized help desk provisioning, and support for administrative and reporting functions related to system restoration.

5.9.3 Hardware & Software Engineering Support

The analysis, design, test, and implementation of hardware and/or software modifications, operational and support elements and sustainment of the NAS including site adaptation. This includes conducting studies for various stages of the support process, second level support studies for software and hardware upgrades, critical operational problems, and system enhancements. Engineering analysis (including human factors analysis) of proposed modifications to determine feasibility, operational impact (functionality, availability, maintainability and reliability), implementation and integration into operational systems. Also includes establishing an infrastructure to implement system upgrades and enhancements to include creating a program support facility, software development tools, licenses and maintenance, and test bed simulation

This activity included here are establishing, maintaining, and providing technical direction and guidance through the issuance of technical instruction books. The activities also include implementation of the gold standard for test and evaluation of NAS systems, key-site testing, and testing of changes. Risk management activities are also included.

5.9.4 Configuration Management

Configuration management, maintenance and control of the operational baseline of NAS Systems and Leased Services by authorizing and releasing all modifications of systems, subsystems, component equipment, and software programs to operational systems and facilities in the NAS. Ensuring appropriate documentation is developed and delivered to establish and maintain the system/service baseline. Reviewing and analyzing initial contractor specifications and design to ensure conformance with government requirements.

5.9.5 Process Improvement

Employing a structured process that supports development and evolution that ensures that appropriate field support, hardware, software and adaptation processes are followed. Documenting the transition criteria for progressing from one stage to the next, and insuring compliance with established quality standards.

5.9.6 Quality Assurance

Developing the AF operational performance criteria requirements and standards for the systems in the NAS to ensure that FAA Quality Assurance standards are met before systems or modifications are released to the field. Ensuring that all critical milestones and requirements have been met for system deployment and operation through the in-service review process. Testing and evaluating the quality of leased services to ensure that modifications of leased services have no adverse impacts on the NAS.

5.9.7 Information System Security

Establishing and maintaining security policies and procedures for NAS systems and subsystems including assessing information security capabilities and levels of effectiveness for all operational NAS systems. Supporting the analysis and prioritization of appropriate security measure enhancements or upgrades for all operational NAS systems. Verifying and analyzing security features incorporated in new or modified systems. Administering the security of software development and distribution platforms, and for the physical security of software development systems. Analyzing source and impact of incursions or attempted incursions. Determining necessary corrective response and implementing corrections.

5.9.8 Recurring NAS System Costs

This includes facility leasing for developmental laboratories, actual replacements for governmentally owned facilities, and facilities to provide support services. System leasing may be required to provide functionality to meet specific government operational requirements. Equipment leasing may be dictated by system operational requirements that involve design limitations and engineering requirements.

5.9.9 Software Licenses

Maintaining software license currency for assemblers, compilers, code libraries, and COTS/Commercially Available Software (CAS) systems.

5.10 Infrastructure Support

Maintenance, operations, and security of leased and owned buildings, structures, grounds, roads, support vehicles for operational systems and people who support or operate those systems. It also includes physical security personnel.

5.10.1 Hazardous Materials Handling

All activities associated with pollution prevention, hazardous waste management and remediation, environmental permitting and auditing, energy audits, safety evaluations, hazard abatement and other activities to assure ongoing environmental, energy and occupational safety and health compliance.

5.10.2 Utilities, Building and Grounds Upkeep and Maintenance

All activities associated with efforts to routinely maintain, modernize, and relocate the buildings, structures, roads, grounds, and support equipment.

Recurring costs of utilities (water, electric, gas, oil, etc.) used to provide heat, air conditioning, and water to sites.

5.10.3 Telecommunications

All activities associated with maintaining, upgrading or modifying operational and administrative communications services required to sustain the operation and maintenance of the NAS facilities. Also includes leases and other recurring telecommunication costs.

5.10.4 Building and Infrastructure Modernization and Improvements

All activities associated with efforts to modernize and upgrade the buildings, structures, roads, and support equipment; i.e. to provide bonding, grounding, lightning protection, heating, cooling, and building accessibility.

5.10.5 Real Estate Management

All activities associated with managing FAA-owned or leased properties. Includes leasing of buildings, structures and grounds in which the operational systems or the people who support or operate systems are located.

5.10.6 Physical Security

All activities associated with providing physical security for a facility or system including security guards, fencing, cipher locks, etc. Also includes upkeep and maintenance of these items.

5.11 Flight Inspections and SIAP Development

All activities associated with flight inspections of the solution, and the development and revalidation of Standard Instrument Approach Procedures (SIAP) including flight certification.

5.12 System Performance Assessment

All activities associated with assessing equipment and system performance and trends, to include metrics development, data collection and trend analysis.

5.13 System Operations

All non-maintenance activities associated with directly operating or monitoring the solution. This includes computer operations, system administration, system security administrators, information security assessments and audits, etc.

6.0 DISPOSITION

All activities required for the disposal management, dismantling/demolition/removal, restoration, degaussing or destruction of storage media and salvage of decommissioned equipment, systems or sites.

6.1 Program Management

All activities required to manage the termination of a decommissioned system or equipment. This effort includes the planning, documentation, coordination, and inspection of decommissioned systems or equipment.

6.2 Decommissioning

All activities required for notices and coordination with all stakeholders on impending decommissioning. Stakeholders include both agency and public organizations.

6.3 Engineering

All engineering activities associated with designs for dismantling, demolition, and or removal of commissioned systems or equipment.

6.4 Environmental Activities

All activities for end-state environmental assessments and cleanup, abatement, and disposal of only hazardous materials as stipulated by laws and regulations.

6.5 Dismantle/Removal

All physical activities associated with the dismantling, demolition and removal of the decommissioned system or equipment.

6.6 Site Restoration/Closeout

All cosmetic activities necessary to restore a site to original acceptable condition as well as all final activities required after site has been restored to acceptable/original condition. These activities include necessary action to return real estate to owner and close project.

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